

Preventive Actions in Dental Disease, Tuberculosis, and Cancer

DON P. HAEFNER, Ph.D., S. STEPHEN KEGELES, Ph.D., JOHN KIRSCHT, Ph.D.,
and IRWIN M. ROSENSTOCK, Ph.D.

IF ONLY a minor percentage of the public consistently takes advantage of available preventive health measures, questions might well be raised about the effectiveness of current efforts in health education. But if it is found that certain subgroups in the population consistently follow preventive health recommendations, then a systematic study of these subgroups in relation to persons that fail to take preventive action might reveal the factors that facilitate or inhibit preventive behavior. Firm data on the preventive behavior of the population should prove useful for planning and practice in preventive medicine.

Unfortunately, the imposing list of studies of health behavior in the literature do not provide definitive knowledge about preventive behavior (1). The vast majority have focused on what might be termed "illness behavior"; that is, behavior following the appearance of visible symptoms. Neither has research revealed the extent to which persons relatively free of symp-

toms voluntarily undertake actions to prevent or detect possible disease. The few studies of preventive behavior (2-4) are of limited value since they were performed, for the most part, on relatively small samples or in highly restricted geographic regions. Moreover, most of the studies obtained measures at only one point in time, thus precluding the analysis of behavioral consistency over time. In addition, such studies usually dealt with responses to a single health condition, which eliminated the possibility of assessing the consistency of behavior across several health conditions.

Methodology

As part of a nationwide study, data were obtained concerning preventive health behavior that largely overcome the limitations cited. During the summer of 1963, approximately 1,500 adult residents of the United States, selected as a sample to represent the adult population living in private households, were interviewed with structured interview schedules developed by the authors. Sample selection and field interviewing were done by the Survey Research Center of the University of Michigan.

The survey utilized a multistage probability sample of persons age 21 years and over living in private households within the conterminous United States. In the first stage of sampling, counties or groups of counties, stratified by several factors including region and size of largest

Dr. Haefner, Dr. Kegeles, and Dr. Kirscht are associate professors, and Dr. Rosenstock is professor, public health administration, University of Michigan School of Public Health, Ann Arbor. This investigation was supported by Public Health Service grant No. CH-00044. The article is based on a paper presented at the 22d annual meeting of the Association of Teachers of Preventive Medicine, Chicago, Ill., October 17, 1965.

city, were selected. In each primary sampling unit about five localities were then chosen. Where the localities were cities, the next stage of sampling involved selection either of blocks from stratified census tracts or clusters of addresses from a city directory (supplemented by an area sample). For other localities, blocks or segments were selected from maps; the dwelling units in these areas were then enumerated by interviewers and a final selection of a compact segment made. At each stage, probability methods were used. For the study itself, the interviewers included all dwellings in a sample segment. In each household, one adult was chosen, using a probability method devised by the sampling section of the Survey Research Center.

The interview focused principally on beliefs and action concerning dental disease, tuberculosis, and cancer that had been selected to provide a range of clinical severity. Those interviewed were questioned about the following actions:

1. Reasons for and recency of the last two visits to a physician, intended to determine the frequency of visits for medical checkups since 1958.

2. Visits to the dentist during the preceding 3 years, intended to determine the frequency of dental visits for prophylactic purposes in the absence of symptoms.

3. Toothbrushing practices, phrased to minimize the tendency to exaggerate for reasons of social acceptability. This was done by asking whether they had "had a chance" to brush their teeth the previous day. If the answer was "Yes," they were asked additional questions to determine the number of times they had brushed their teeth and at what times during the day. The intent was to determine whether respondents had brushed after one or more meals.

4. Whether, when, and for what reasons respondents had been examined or tested for detection of tuberculosis or cancer during the preceding 10 years. The intent was to determine the frequency with which such tests were sought voluntarily.

Different time intervals were used for analyzing each action reported in the original survey: the previous day for toothbrushing practices, 3 years for prophylactic dental visits,

5 years for preventive medical visits, and 10 years for tests and checkups for tuberculosis and cancer. The time periods selected were intended to provide at least twice the interval usually recommended for each procedure. However, since professionals differ in their recommendations, considerable arbitrariness occurred in the final choice of time periods.

During the fall of 1964, approximately 15 months after the original survey, information on the same topics was gathered from a randomly selected subsample of the original respondents. This resurvey included 589 respondents. For reasons of economy and speed, the resurvey was conducted by interviewing 454 respondents by telephone and mailing questionnaires to the 135 who could not be reached by telephone. In the resurvey, the analysis of all health behaviors except toothbrushing dealt with actions reportedly taken during the 15-month interval between the original survey and the resurvey. For toothbrushing, the analysis referred to behavior on the preceding day.

Our findings provide information on the extent to which people took each preventive action, the consistency of preventive behavior shown by respondents, and personal factors associated with taking the actions. All the findings are statistically reliable beyond the 5 percent level of chance probability unless otherwise specified.

Findings

Preventive and prophylactic behavior. Data from the original survey refer to time intervals broad enough to encompass all the preventive behavior that could appear. For example, the person who has not taken a single screening test for tuberculosis, given the opportunity over a 10-year span, is almost certainly not preventively oriented in that area. On the other hand, while the 15-month interval used in the resurvey is long enough perhaps to permit measures of preventive behavior in certain areas such as toothbrushing and preventive visits to the dentist, 15 months is hardly sufficient time to permit a definitive statement concerning the extent of preventive behavior in the other medical areas. For this reason, we present only the findings from the original survey in this section of the paper.

Table 1. Percentage of respondents who reported taking each health action, original survey

Health practice	Base-line number	Percentage of respondents taking action
<i>Preventive and prophylactic behavior</i>		
Asymptomatic visit to physician for checkup during preceding 5 years:		
Any asymptomatic visit.....	1, 479	46.0
Asymptomatic voluntary visit by those eligible to do so.....	872	71.2
Asymptomatic visit to dentist for checkup during preceding 3 years.....	1, 063	50.1
Toothbrushing after 1 or more meals on preceding day.....	1, 086	56.8
After 1 meal.....	1, 086	27.4
After 2 meals.....	1, 086	29.4
<i>Screening behavior</i>		
Asymptomatic test for tuberculosis during preceding 10 years:		
Any asymptomatic test.....	1, 438	75.9
Asymptomatic voluntary test by those eligible to do so.....	768	54.8
Asymptomatic test for cancer during preceding 10 years.....	1, 267	29.8
As part of other medical procedure.....	1, 267	26.4
Asymptomatic voluntary test.....	1, 267	3.4

Proportion of sampletaking actions. It should be noted that baseline numbers for the various actions differ because relevant questions were asked of different numbers of respondents. Questions on dental behavior, for example, were restricted to people having five or more teeth. Questions on cancer tests and tuberculosis tests were not asked of people having had the disease. Also excluded are respondents from whom codable responses were not obtained.

When asked about their two most recent visits to a physician, slightly less than half the sample reported having at least one checkup during the preceding 5 years in the absence of symptoms or other medical indications (table 1). This number is somewhat misleading, however, since the total sample included more than 600 persons who could not be classified meaningfully concerning voluntary preventive

visits for a checkup. Among these were 548 people whose two most recent visits were for symptomatic reasons and 59 persons who had a medical checkup under nonvoluntary circumstances; for example, an insurance examination or job requirement. Such people were then eliminated to restrict the analysis to those who clearly could have made voluntary, asymptomatic checkup visits to a physician. As a result, the baseline total was sharply reduced (by 607 persons) while the number taking action decreased only slightly (by 59 persons). In this more refined analysis, 71 percent of the eligible persons reported making at least one such visit within the preceding 5 years.

More than half of the sample reported making one or more voluntary prophylactic visits to the dentist without symptoms within the 3 years before the interview. Similarly, more than half reported brushing their teeth on the day preceding the interview after at least one meal, and nearly 30 percent reported brushing after two or more meals.

More than 75 percent of the sample reported that during the preceding 10 years they had taken one or more tests, usually an X-ray, to check for the presence of tuberculosis. However, less than 30 percent obtained such tests on a purely voluntary basis in the absence of symptoms. The majority of tests were either compulsory or medically dictated. About 25 percent of the sample failed to report tests for tuberculosis during the preceding 10 years. When the analysis was restricted to those who clearly could have taken voluntary, asymptomatic tests for tuberculosis, only 55 percent reportedly took at least one X-ray within 10 years.

In the detection of cancer, only about 30 percent of the sample mentioned specific tests or checkups within the 10-year period, and only 3.4 percent of the respondents obtained such tests voluntarily. Even when 335 persons who had obtained cancer tests on a nonvoluntary basis or in the presence of medical symptoms were eliminated from the analysis, the reported incidence of voluntary, asymptomatic cancer tests among the clearly eligible was still extremely low (4.6 percent).

The original survey, then, disclosed that about one-third of an eligible public had not

visited physicians for checkups during the previous 5 years, about half had not made a prophylactic visit to the dentist within the last 3 years, and nearly half had failed to brush their teeth after a single meal on the day preceding the interview. Nearly half who could have taken voluntary tuberculosis tests in the absence of symptoms failed to take a single test in the past 10 years, and only about 1 in 20 who could have taken a voluntary test for cancer while asymptomatic had received any such test in the same period. It is thus clear that though each of the preventive health actions, except screening tests for cancer, was taken by a substantial proportion of the public, a sizable number who could have taken each of the preventive actions did not do so.

Several questions arose from these findings. One question was whether people in our sample evidenced a general behavioral orientation toward health; that is, was there consistency in the way they took or failed to take action or was their health behavior essentially a chance occurrence? Another question concerned the factors associated with taking or failing to take action.

General orientation toward health action. In order to examine whether the behavior of the survey sample reflected a general orientation toward taking preventive health action, it was necessary to study actions that could be taken by everyone. Only women could take the leading, widely available screening test for cancer, the Papanicolaou cervical smear. Furthermore, the base rate of that action by the women in our sample was so low as to limit severely

its contribution to the understanding of preventive behavior. We therefore decided to exclude cancer screening tests from our analysis concerning general preventive action. A separate paper dealing with women's behavior concerning cancer screening has been published (5). The analysis of general orientation therefore was based on four actions: toothbrushing, prophylactic dental visits, visits to a physician for a checkup, and tuberculosis screening tests. These are, of course, by no means exhaustive of actions relevant to a general orientation toward prevention. Excluded from the study, due to limitations of time, were such topics of current interest as diet and exercise as preventive actions in coronary heart disease.

The general issue of whether people behaved consistently concerning their health was subdivided into two separate questions: (a) did members of the survey sample display consistency of behavior across the different health actions, and (b) did respondents behave consistently with respect to the given actions over time?

General behavior across health actions. Persons who had taken and those who had failed to take a given action on a voluntary, asymptomatic basis were compared to determine the extent to which they had taken a combination of the other three actions. For example, those who had visited their physician for a checkup and those who had not were compared for the total number of other actions they had taken, with each action given equal weight. The same analysis was repeated in turn for each remaining preventive action. A total of 297

Table 2. Association between taking a particular health action voluntarily and taking other health actions voluntarily, original survey, in percent

Number of other actions	Checkup visit to physician ¹		Checkup visit to dentist ²		Brushed teeth after meals ³		Took tuberculosis test ⁴	
	No (N=93)	Yes (N=204)	No (N=150)	Yes (N=147)	No (N=129)	Yes (N=168)	No (N=122)	Yes (N=175)
0-1-----	74.2	28.9	49.4	10.3	45.0	31.0	55.0	26.3
2-3-----	25.8	71.1	50.6	89.7	55.0	69.0	45.0	73.7

¹ $\chi^2=51.66$, $P<0.001$, 1 degree of freedom.

² $\chi^2=49.32$, $P<0.001$, 1 degree of freedom.

³ $\chi^2=5.56$, $P<0.02$, 1 degree of freedom.

⁴ $\chi^2=23.80$, $P<0.001$, 1 degree of freedom.

respondents were included in these analyses, since they were the only persons who had the opportunity to take all four health actions on a voluntary, asymptomatic basis. Persons who failed to meet this criterion were excluded from the analysis, as were those with fewer than five teeth, those reporting a history of tuberculosis, and those who could not be coded on each of the four actions.

In each instance, those who took a particular action had higher scores on a combination of other behaviors than those who failed to take the action. In the original survey, all the differences were statistically reliable though modest in size (table 2). The same pattern of results also emerged in the resurvey, but not always to a statistically significant degree. Since the recommended time interval for taking a number of actions exceeded the 15-month period between the two phases of the study, a generalized preventive orientation may not have had time to manifest its full extent in the resurvey.

An analysis was also made of the extent to which taking a given action was related to taking other particular actions (table 3). Making a checkup visit to the dentist showed the greatest overlap with taking other single actions.

The fact that behavior in the various preventive actions was consistent beyond chance expectations can be regarded as supporting the idea that people displayed a generalized pattern of response concerning preventive health action. However, it should also be remembered that such consistency was present only to a moderate degree.

Strictly speaking, one can only generalize a finding to people like those included in the analysis. To provide at least a rough check on whether the 297 respondents were representative of the entire sample, those eligible for inclusion in the analysis were compared on demographic characteristics with those excluded. In the original survey, such comparisons yielded uniformly nonsignificant differences. The resurvey yielded the same result with the single exception that significant age differences were found between the two groups. In general, the eligible group contained an excess of younger persons and a deficit of older

persons while the reverse was found for the ineligible group. This was most pronounced for the youngest and oldest age levels studied, 21-34 years and 65 years and over.

The most likely explanation for this finding seems to be the relatively brief interval of 15 months between the original survey and resurvey. One might expect younger people to be more likely to be symptom-free during the short time interval and thus be eligible for inclusion in the analysis. Conversely, older people would be expected to be more likely to have experienced symptoms during that time and thus be ineligible for inclusion.

It is, of course, possible that the eligible and ineligible groups might have differed significantly on important factors that were not measured in this study. However, with the single exception just noted, such differences were not found on demographic characteristics, themselves a significant source of variation in health behavior.

Consistency of behavior over time. To determine whether people behaved consistently over time, voluntary actions reported in the original survey were compared with those reported in the resurvey (table 4). The number of respondents included in this series of analy-

Table 3. Association between taking a given health action voluntarily and taking another health action voluntarily, original survey, in percent

Second action	Respondents who took 1 action			
	Checkup visit to physician (N = 204)	Checkup visit to dentist (N = 147)	Brushed teeth after meals (N = 168)	Took tuberculosis test (N = 175)
Checkup visit to physician	-----	85.7	73.8	81.1
Checkup visit to dentist	61.7	-----	54.8	58.8
Brushed teeth after meals	60.7	62.6	-----	57.1
Took tuberculosis test	69.6	70.0	59.5	-----

ses depended on the particular behavior being analyzed. Inclusion required a scoreable response on the action being studied for both the original survey and resurvey. Persons who were not eligible to take the action voluntarily on an asymptomatic basis, those with fewer than five teeth, those who reported a history of tuberculosis, and those who could not be coded on the action in question were excluded from the analyses. In analyzing consistency of total number of actions taken, the attrition rate for respondents was especially high since each respondent had to meet the above criteria for all four behaviors.

For one analysis, the four separate actions were combined into an overall index of preventive behavior with each action given equal weight. This was deemed appropriate because of the previous finding that the four behaviors were significantly interrelated. When the index scores of individual respondents on the two occasions were compared, we found a marked consistency of behavior.

In other analyses, we found a nonchance consistency of behavior over time for each of the four separate actions studied; persons who reported in the original survey that they took an action also tended in the resurvey to report having taken that action again. Similarly, those who reportedly failed to take an action when originally questioned subsequently tended to re-

port not having taken that action when resurveyed.

These data and those cited earlier concerning the generality of behavior across health actions support the tenability of the idea of a general behavioral orientation.

Associated demographic factors. Since the survey groups were found to have behaved with some degree of consistency, it seemed important to know what differentiated those who took preventive action from those who did not. To answer this question, the association between preventive behavior and a series of five personal characteristics—sex, age, education, occupation, and income—was examined (table 5). Only the respondents who had the opportunity to take all four actions on a voluntary, asymptomatic basis could be included in these analyses. Persons who failed to meet this criterion were excluded as were those with fewer than five teeth, those who reported a history of tuberculosis, those who could not be coded on each of the four actions, and those who could not be coded on the demographic variable being analyzed. The findings follow.

Demographic characteristics were found to be associated with voluntarily taking several health actions. The patterns of response according to personal characteristics proved to be similar in the original survey and the resurvey.

Data on education, income, and occupation all

Table 4. Association between voluntary health actions reported in original survey and in resurvey, in percent

Actions in resurvey	Actions in original survey									
	Checkup visit to physician ¹		Checkup visit to dentist ²		Brushed teeth after meals ³		Took tuberculosis test ⁴		Total number of actions taken ⁵	
	No (N=68)	Yes (N=154)	No (N=143)	Yes (N=208)	No (N=179)	Yes (N=255)	No (N=92)	Yes (N=130)	0-2 (N=22)	3-4 (N=35)
Yes-----	10.3	33.8	14.0	68.3	38.0	70.2	10.9	26.9	(2-4) 13.6	68.6
No-----	89.7	66.2	86.0	31.7	62.0	29.8	89.1	73.1	(0-1) 86.4	31.4

¹ $\chi^2=13.32$, $P<0.001$, 1 degree of freedom.

² $\chi^2=100.48$, $P<0.001$, 1 degree of freedom.

³ $\chi^2=44.48$, $P<0.001$, 1 degree of freedom.

⁴ $\chi^2=8.59$, $P<0.001$, 1 degree of freedom.

⁵ $\chi^2=14.22$, $P<0.001$, 1 degree of freedom.

Table 5. Association of demographic characteristics of respondents with total number of voluntary health actions, original survey

Demographic characteristics	Number of respondents	Percent taking—	
		0-2 actions	3-4 actions
Education: ¹			
Grade school or less...	76	80.3	19.7
Some high school....	55	56.4	43.6
Completed high school.....	92	38.0	62.0
Some college.....	39	20.5	79.5
Completed college...	35	22.9	77.1
Occupation: ²			
Farm.....	13	69.2	30.8
Service, laborers.....	31	61.3	38.7
Operatives.....	34	61.8	38.2
Skilled labor.....	41	46.3	53.7
Sales, clerical.....	48	27.1	72.9
Managers.....	45	51.1	48.9
Professionals.....	32	9.4	90.6
Income: ³			
Under \$3,000.....	55	80.0	20.0
\$3,000-\$5,999.....	73	60.3	39.7
\$6,000-\$9,999.....	79	35.4	64.6
\$10,000 or more.....	55	20.0	80.0
Age (years): ⁴			
21-34.....	75	42.7	57.3
35-44.....	81	38.3	61.7
45-54.....	52	50.0	50.0
55-64.....	41	48.8	51.2
65 and over.....	47	72.3	27.7
Sex: ⁵			
Male.....	127	52.0	48.0
Female.....	170	45.3	54.7

¹ $\chi^2 = 57.55$, $P < 0.001$, 4 degrees of freedom.

² $\chi^2 = 29.03$, $P < 0.001$, 6 degrees of freedom.

³ $\chi^2 = 45.61$, $P < 0.001$, 3 degrees of freedom.

⁴ $\chi^2 = 15.14$, $P < 0.01$, 4 degrees of freedom.

⁵ $\chi^2 = 1.29$, P insignificant, 1 degree of freedom.

provided the same findings. People at the higher levels of each demographic characteristic were far more likely than people at the lower levels to have taken three or four of the actions. This was true both for the overall index of preventive behavior and for each individual action as well. We recognize that the three variables are interrelated and that various combinations are often employed as an index of socioeconomic status or social class. The other two demographic variables studied, sex and age, provided less clear-cut results.

Sex. Sex differences in the overall index of preventive action, though favoring women, were not statistically significant for the original survey. In the resurvey, however, women scored reliably higher than men in the overall

index of preventive action. In individual health actions, women were much more likely than men to report having brushed their teeth after one or more meals and having obtained checkups from a physician. These differences held true in both the original survey and the resurvey. While women probably had greater physical opportunity than men to brush their teeth after lunch, this would not appear to account fully for the sex difference in toothbrushing. The criterion was whether or not the respondent had brushed his teeth after at least one meal during the preceding day, not how often he had brushed them.

An interesting finding concerned prophylactic visits to a dentist. In the original survey, no sex difference was found in the proportion making one or more dental visits. In the resurvey, however, many more women than men reported taking that action. The longer interval (3 years) used to categorize respondents in the original survey may have obscured a basic difference in the rate at which men and women visited a dentist for prophylaxis. Those who had made several visits during the 3-year period were placed in the same category as those who had made only a single visit during that time, since both had satisfied the basic requirement. In the resurvey, however, the time interval of 15 months was sufficiently brief to bring out the sex difference in rate of visits.

With respect to voluntary screening tests for tuberculosis, the two sexes showed only slight and insignificant differences in either survey.

Age. The various age groups showed pronounced differences in the overall index of preventive action. Both in the original survey and the resurvey, the older groups had lower scores than younger persons. With respect to individual actions, age was negatively related to making dental visits and to taking tuberculosis tests. This finding was statistically significant in the original survey and in the same direction, though not reliably so, in the resurvey. The various age groups also differed markedly in the original survey concerning physician visits. The relation between age and checkup visits to physicians was curvilinear: Among the eligible respondents, those in the age groups 21-34 years and 55-64 years reported

the highest incidence of such visits, and those age 65 and over reported the fewest visits. The same type of finding concerning physician visits was obtained in the resurvey, but this time the differences were not statistically reliable. Age proved to be unrelated to toothbrushing practices in either survey.

Discussion

The survey groups tended to behave consistently across actions and over time. Those who took one preventive action were the ones most likely to take the other preventive actions. Furthermore, when their behavior was compared for different time periods, those who took a given action within one time period were most likely also to have taken that action again.

People of upper socioeconomic status, that is, those of higher education, income, and occupation, consistently took more preventive actions than persons of a lower socioeconomic level.

The relations of single actions and the overall index of preventive behavior to people's personal characteristics indicate the involvement of socioeconomic level within our society to the taking of preventive actions. But while ability to pay was undoubtedly an influential factor in taking many actions, those with higher incomes were also most likely to follow recommended practices in toothbrushing, an action within the financial capability of all but the most destitute.

In the same vein, the positive association between educational level and taking health actions might at first seem easily interpretable at face value. Part of the educational process includes learning about disease and its prevention, and presumably those with more schooling were given more information on which rational health decisions might be based, resulting in the translation of such information into appropriate action. Yet different people profited differently from similar educational opportunities. In the original survey, among the college educated, one-sixth had not availed themselves of preventive checkups, more than one-fourth had not visited the dentist preventively, and one-fifth had not had tuberculosis tests. Even for brushing teeth after meals, more than 40 percent of the college group had not taken the action.

Although these findings may point to the

need for greater efforts in urging persons of lower socioeconomic status to behave preventively, they do not provide a simple answer on how to do so. Our findings on the association between toothbrushing and level of income and the failure of some highly educated people to take action raise questions about the basis for changing the general behavior toward preventive action.

The associations between preventive behavior and levels of education, income, and occupation may reflect a much more complex mechanism at work than simply a combination of knowledge and ability to pay. It has been demonstrated that various social classes have characteristic, institutionalized patterns for obtaining many types of services including health services (6,7). It is possible and suggested by prior research (8) that those with lower social status tend not to take health action until disabling symptoms occur. Although such people may in part lack medical knowledge, what is more important is that members of these groups may regard it as not appropriate for them to do anything about health until a disabling illness strikes.

If education, income, and occupation are not directly reflected in people's health behavior, then providing persons of lower socioeconomic class with appropriate information or reducing or eliminating the cost of preventive health actions will not be enough. Confronting a person with information is not likely to change in any material way his socially defined view of what is appropriate behavior. If this line of reasoning is valid, it would be necessary to work within the particular social network of the person to change his views concerning appropriate behavior patterns.

One possibility that appears worth investigating is shifting the focus of programs from the adults of today to the adults of tomorrow, the children. The aim of such an approach would be the development of desirable health practices during the process of socialization. For intervention of this sort to be maximally successful, however, the efforts of schools, parents, the mass media, and other social institutions would need to be coordinated. Too often, educational efforts in one of these areas have tacitly ignored the influence exerted on the same behavior by other social forces. What is sug-

gested is an approach that attempts to make systematic use of the power exerted by all of these, employing them to reinforce each other at a time when the person is most receptive to influences on his beliefs and behavior. The soundness of the suggested approach has never been demonstrated, but it would seem to offer a potentially fruitful avenue for research and demonstration.

Summary

Data on reported preventive actions concerning dental disease, tuberculosis, and cancer were collected in 1963 and 1964 as part of a national survey of health beliefs and behavior. Four preventive health actions—toothbrushing, prophylactic dental visits, visits to a physician for a checkup, and tuberculosis screening tests—were taken by a substantial proportion of the sample studied. However, a sizable proportion of those who could have taken each preventive action on a voluntary, asymptomatic basis failed to do so.

To understand better the basis for taking and not taking voluntary preventive action, analyses were made of the extent to which people behaved consistently with regard to their health and of the factors associated with taking various actions. Consistency of behavior far above chance expectancy was found both across preventive health actions and over time: those who took any one action were also most likely to take other actions, and those who took a particular action during a specified time period were the most likely to take that same action again.

Relations between demographic characteristics and preventive behavior generally were similar to those obtained in other studies. Persons with a lower level of education, occupation, and income had a lower rate of taking the various preventive actions than persons of higher socioeconomic level. Age and sex showed less clear-cut relations to behavior.

The difference between upper and lower socioeconomic levels in rate of taking the various health actions held true both for behaviors that involve ability to pay, such as obtaining medical and dental checkups, and for actions with minimal cost, such as toothbrushing. These findings

may reflect the operation of a much more complex process than simply a combination of knowledge and ability to pay. Findings from other studies were cited, showing that people at various socioeconomic levels possess different socially defined views of what is appropriate behavior, including health behavior, and that these views heavily determine what actions they take. Simply reducing the financial cost of preventive health actions or confronting a person with information is not likely to change his behavior unless ways can also be found to change the characteristic thinking of his social group concerning appropriate behavior patterns.

There is as yet little scientific basis for proposing effective ways of changing social group norms. The authors suggest that an approach which focuses on children and enlists the aid of the opinion leaders and power structures relevant to children may hold hope of greater future gain in changing health practices than current approaches which focus on adults.

REFERENCES

- (1) Rosenstock, I. M.: Why people use health services. *Milbank Mem Fund Quart* 64: pt 2, 94-127, July 1966.
- (2) Hochbaum, G. M.: Public participation in medical screening programs. PHS Publication No. 572. U.S. Government Printing Office, Washington, D.C., 1958.
- (3) Kegeles, S. S.: Why people seek dental care: a test of a conceptual formulation. *J Health Hum Behav* 4: 166-173, fall 1963.
- (4) Leventhal, H., Rosenstock, I. M., Hochbaum, G. M., and Carriger, B. K.: Epidemic impact on the general population in two cities. *In* The impact of Asian influenza on community life: a study in five cities. PHS Publication No. 766. U.S. Government Printing Office, Washington, D.C., 1960.
- (5) Kegeles, S. S., Kirscht, J. P., Haefner, D. P., and Rosenstock, I. M.: Survey of beliefs about cancer detection and taking Papanicolaou tests. *Public Health Rep* 80: 815-823, September 1965.
- (6) Anderson, O. W.: The utilization of health services. *In* Handbook of medical sociology, edited by H. E. Freeman, S. Levine, and L. G. Reeder. Prentice-Hall, Englewood Cliffs, N.J., 1963.
- (7) Simmons, O. G.: Social status and public health. Pamphlet 13, Social Science Research Council, New York, 1958.
- (8) Koos, E. L.: The health of Regionville. Columbia University Press, New York, 1954.



Federal Publications

Assembling Equipment in the Packaged Disaster Hospital. *PHS Publication No. 1071-F-14; 1966; 135 pages; \$1.* Provides simplified, detailed, step-by-step instructions with accompanying photographs for assembling 25 pieces of equipment for the Packaged Disaster Hospital. Describes usage of equipment in the text when it is necessary to explain assembly. Serves as a training guide for those who will direct the setting up of the equipment. Also serves as a training manual for those who will set up the equipment and as a valuable aid to familiarize planners for emergency health preparedness with this aspect of PDH activity.

General Stores Section of the Packaged Disaster Hospital. *PHS Publication No. 1071-F-17; 1966; 15 pages; 15 cents.* Provides guidance for setting up and operating the general store section of the Packaged Disaster Hospital with instructions on inventory, maintenance, distribution, storage, and replenishment of supplies. Gives plans for staffing, locating, and furnishing the section. Includes information on special storage for specific items. Serves as a guide to those who may set up, operate, and supervise this section of the PDH, to emergency health planners concerned with the PDH, and to others who may be asked to staff the section.

A Computer Program for the Analysis of Gamma-Ray Spectra by the Method of Least Squares. *PHS Publication No. 999-RH-21; August 1966; by Charles R. Phillips, Jon A. Stewart, and T. Whit Athey III; 23 pages.* Presents a computer program, written in Fortran II and Fortran IV languages for the IBM 1620 and 7040-1401 computers, for the analysis of gamma-ray spectra by the methods of least squares. Includes, in appendices, the Fortran IV main program and four subroutines. The method is accurate, agreeing

favorably with estimated standard deviations and is sufficiently sensitive to be useful for routine analysis of gamma-ray spectra of a substantial number of low-activity samples. Data provided by a verification experiment show that the least squares method is more accurate than the simultaneous equations method.

Administrative Aspects of Hospital Central Medical and Surgical Supply Services. *PHS Publication No. 930-C-12; March 1966; 37 pages; 30 cents.* Presents a composite review of factors to be considered in planning hospital central medical and surgical supply services, such as administrative considerations, relationships with other departments, records and reports, product testing and evaluation, personnel, disaster planning, and budget. Provides information on current administrative concepts as they relate to the planning of these services.

Design of Facilities for the Mentally Retarded. *PHS Publication No. 1181-C-1; 1966; 46 pages; 35 cents.* Presents guidelines for architectural planning of physical facilities for the mentally retarded. Describes diagnostic and evaluation facilities, day care centers, education and training facilities, including sheltered workshops, and living units for ambulatory and nonambulatory retardates. Includes prototype plans and tables giving the approximate areas for the spaces shown in the plans.

Routine Surveillance of Radioactivity Around Nuclear Facilities. *PHS Publication No. 999-RH-23; December 1966; By Interlaboratory Technical Advisory Committee; 28 pages; 25 cents.* Presents a concise, comprehensive, and practical guide for planning, operating, and evaluating the effectiveness of a program for routine surveillance of radioactivity around nuclear facilities.

Includes references to regulations and guides for evaluating releases to be anticipated, their fate when released to the environment, and recommended procedures for sampling the air, water, milk, food, biota, soil, and people for resulting contamination.

Hemophilia. *PHS Publication No. 1420 (Health Information Series No. 131); 1966; leaflet; 10 cents, \$5 per 100.* Describes hemophilia. Presents facts about the disease, its causes and treatment. Tells of progress in research to develop a highly concentrated form of antihemophilic factor, which could be used by a hemophiliac much the same way as insulin is used by a diabetic.

Pinworms. *PHS Publication No. 108 (Health Information Series No. 51); reprinted 1966; leaflet; 5 cents, \$2 per 100.* Describes the life cycle of the pinworm, transmission of infection, symptoms, and diagnosis and treatment by a physician. Gives detailed methods of preventing the spread of infection within a household.

Hooked. 1966; 31 pages. Presents, in comic book form, a story of the results of narcotic addiction, told in the language of a drug addict. Depicts accurately the path to heroin addiction. This four-color booklet is designed for use in schools and for distribution by local public health departments, especially those in high-risk neighborhoods.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington, D.C. 20201.

The Public Health Service does not supply publications other than its own.
